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The Macho Project: Microlensing and Variable Stars

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The Macho Project is using both Magellanic Cloud and Milky Way bulge stars as sources to search for the gravitational microlensing signature of baryonic dark matter in the Milky Way's halo. These fields provide millions of relatively bright, resolved stars with lines of sight through much of the halo. The MACHO Project has created a database of CCD photometry using the Mt. Stromlo 1.27-m telescope which spans 4 years for about 10 million stars in the LMC and 12 million stars in the bulge in order to search for exceedingly rare microlensing events. We have detected about 10 microlensing events toward the LMC, and 100 microlensing events toward the bulge. We have also cataloged about 40,000 variables stars in each of these directions.

The survey parameters of the Macho Project will be reviewed with emphasis on the techniques used to identify variable stars. The detection efficiency, magnitude limits, and spatial extent of our survey have created essentially complete catalogs of the brighter or large amplitude variables. The Macho survey also probes infrequent and aperiodic variability such as found in novae, R Coronae Borealis stars, and massive young stars, and low-level periodic behavior in complex systems such as the supersoft X-ray source, RX J0513-69. The combination of wide area coverage, dense temporal sampling, and uniformity of data product found in the Macho survey is yielding a new perspective on stellar pulsation physics, chemical and dynamical evolution of the observed populations, and may solve the discrepant RR Lyrae and Cepheid distance scales.

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